

ELECTRONIC MUSICAL INSTRUMENT
ROLAND SYNTHESIZER
SH-1000

**SERVICE
MANUAL**

THE 4th EDITION
Printed in Japan. '75. Sep.
APPLIED FROM SERIAL No.270800



Roland Corporation

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GENERAL SCHEMATIC DIAGRAM (Inserted sheet)

ELECTRONIC MUSIC SYNTHESIZER MODEL SH-1000

ROLAND SYNTHESIZER

1. SPECIFICATIONS

*37 Keys (F Scale)

The musical interval can be varied one octave up or down via the Transpose Changeover Switch.

*Preset Tablet

TUBA, TRUMPET, SAXOPHONE, FLUTE, CLARINET, OBOE, VIOLIN, BASS GUITAR, HARPSICHORD, PIANO

*VCO Assembly (Voltage Controlled Oscillator)

1) Combination Tablet 9

 32' Sawtooth, 16' Square, 16' Pulse, 8' Square, 8' Pulse,
 8' Sawtooth, 4' Sawtooth, 2' Square, Noise

2) Modulation Tablet 3

 VIBRATO, DELAY, ~/□

3) Vibrato Depth Control (VCO Modulation) 1

4) Pitch Control 1

5) Glide Switch 1

6) Portamento Time 1

7) Portamento Switch 1

8) Transpose Changeover Switch (L/M/H) 1

*VCF Assembly (Voltage Controlled Filter)

1) Spectrum Tablet 3

 GROWL, WAW, A.D.S.R.

2) Sensitibility Control 3

 GROWL, WAW, A.D.S.R.

3) Filter Resonance Control 2

 CUTOFF FREQ, RESONANCE

*VCA Assembly (Voltage Controlled Amplifier)

1) Envelope Tablet 5

 A.D.S.R., SLOW ATTACK, STACCATO, PERCUSSION, HOLD

2) Modulation Tablet 2

 TREMOLO, ~/~~

3) Tremolo Depth Control 1

 AMP. Modulation

*Others

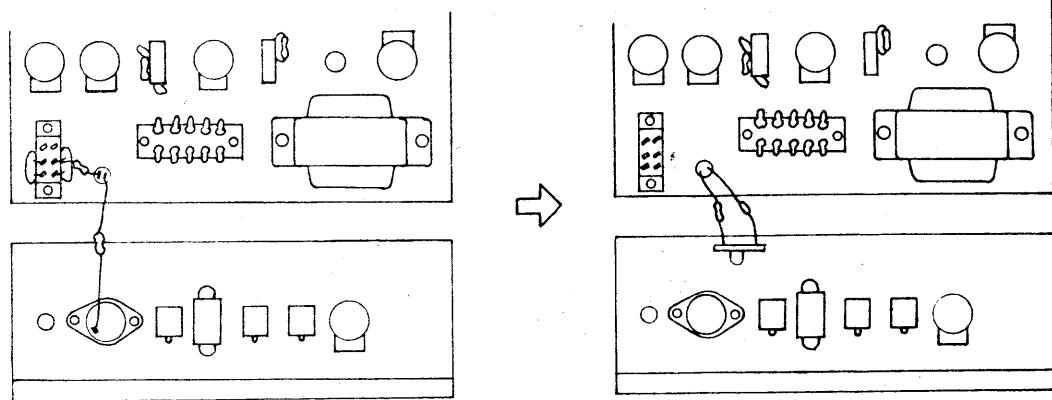
1) Envelope Control	4
Attack, Decay, Sustain, Release	
2) Modulation Generator	2
~RATE, ~/□ RATE	
3) Noise Generator Volume	1
4) White/Pink Noise Changer	1
5) Random Note Switch	1
6) Volume	1
7) Tuning	1
8) Output Jack	1
9) Output Voltage Changeover Switch (L/M/H)	1
10) Jack for Glide	1
11) Jack for V.C.F. Control	1
12) Voltage Changer (for changing AC Voltage)	1
13) Power Source	AC 100, 117, 220, 250V 50/60 Hz
14) Power Consumption	8W
15) Dimensions	H : 150mm (5.9") W : 865mm (34") D : 260mm (10.22")
16) Weight	12 Kg (26.5 Lbs.)
17) Accessories	Music Rack Connection Cord (2.5m with Pin-Plug Adaptor)
* Accessories (optional) Volume Control Pedal FV-1 (for controlling Sound Volume or V.C.F. Cut-Off Frequency)	
Foot Switch DP-1 (for controlling Glide effect)	

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

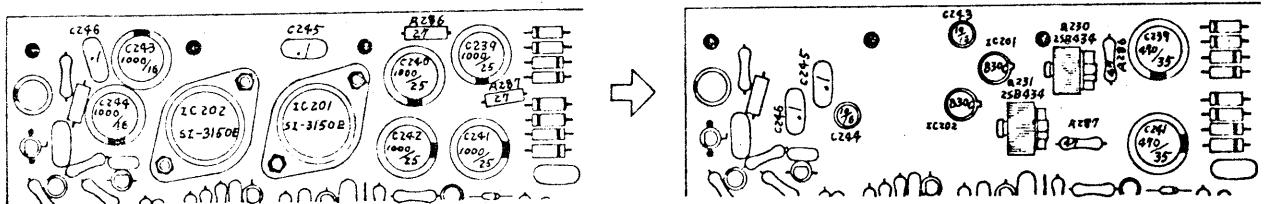
INFORMATION ON CHANGE OF CIRCUIT CONSTANT

(Applied from SERIAL No.286300)

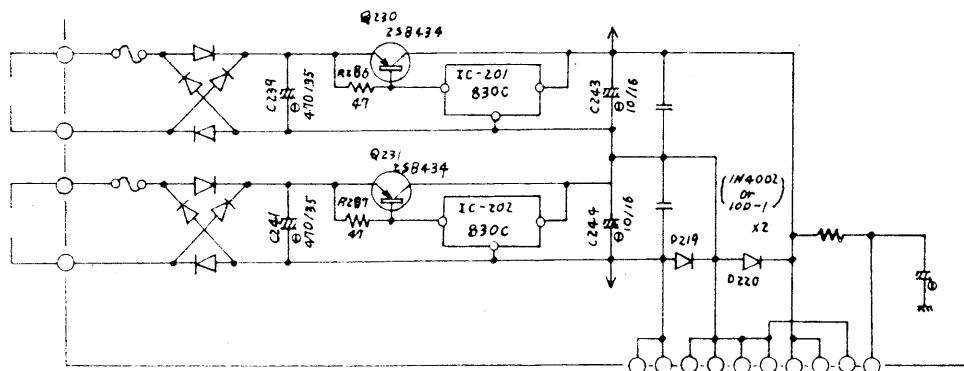
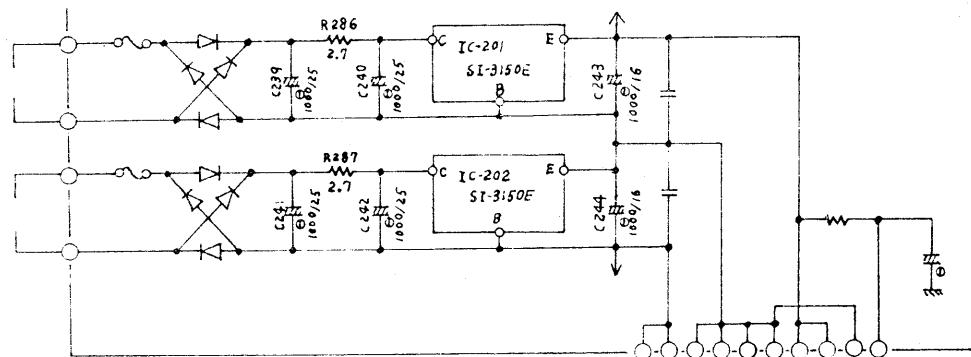
P.3 Changed part of location is shown as follows.



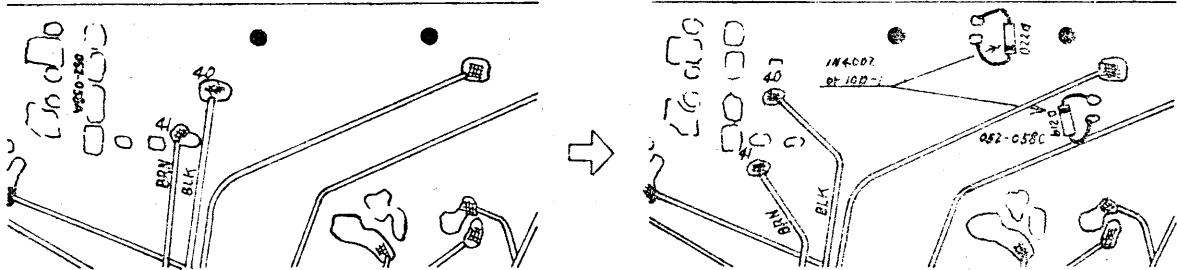
P.10 Changed part of parts layout(PL-1) is shown as follows.



P.11 Changed part of circuit diagram(PL-1) is shown as follows.



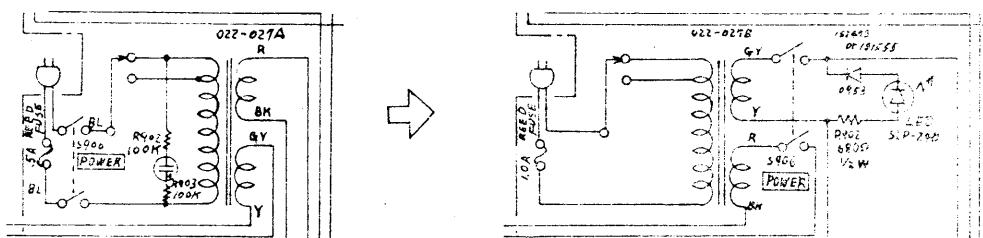
P.12 Changed part of rear side wiring(PL-1) is shown as follows.



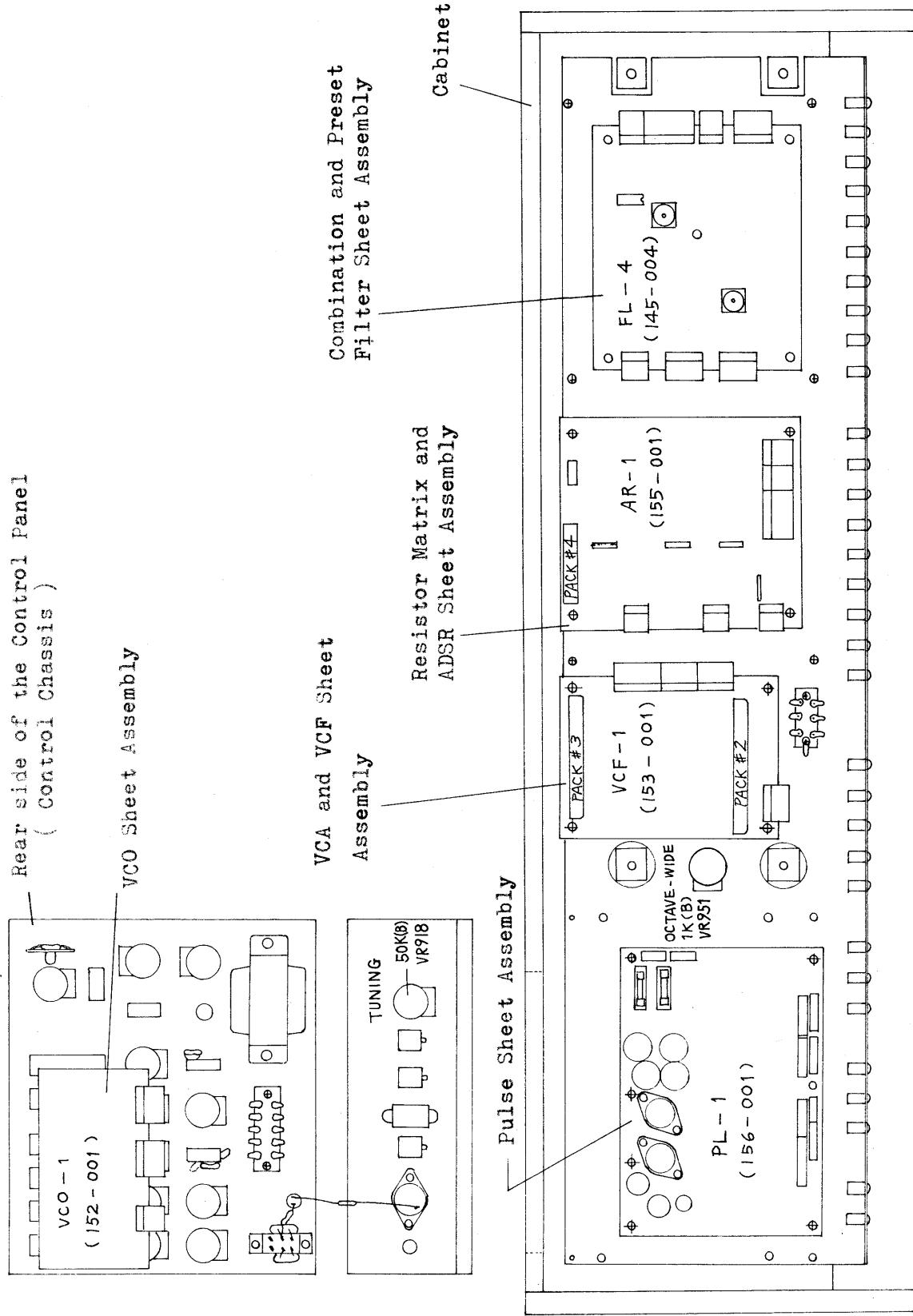
PARTS LIST ; Change the former to the latter.

	THE FORMER	THE LATTER
P.19		
The 19th line from the bottom	Pilot Lamp BN-8 Red 025-003	LED SLP-24B Bracket No.4 019-013 062-004
P.20		
The 26th lines from the top	IC SI-3150E 020-013	IC 830C Silicon Transistor 2SB434 020-014 017-022
P.21		
The 19th line from the bottom	2.7ohm ERC-12GK 044-095	680ohm ERC-12GK 044-124
P.22		
The 19th and the 20th lines from the top	1000mfd ECE-A16V 032-041 1000mfd ECE-A25V 032-055	470mfd ECE-A35V 032-068
P.22		
The 3rd line from the bottom	IC Socket 012-006	Heat Sinker No.15 SB-7 048-018

Changed part of general schematic diagram is shown as follows.

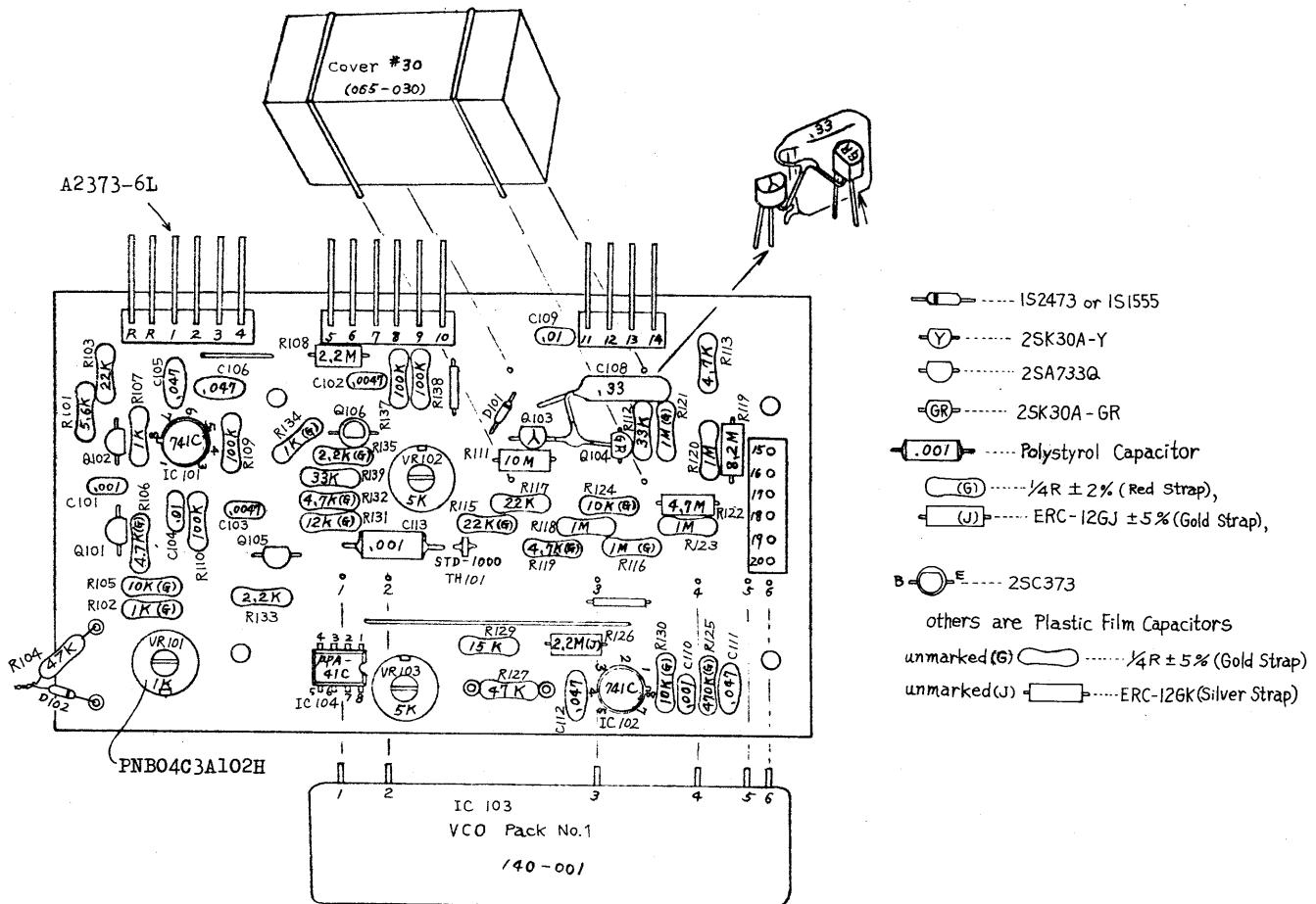


2. LOCATION OF THE CIRCUIT BOARD ASSEMBLIES



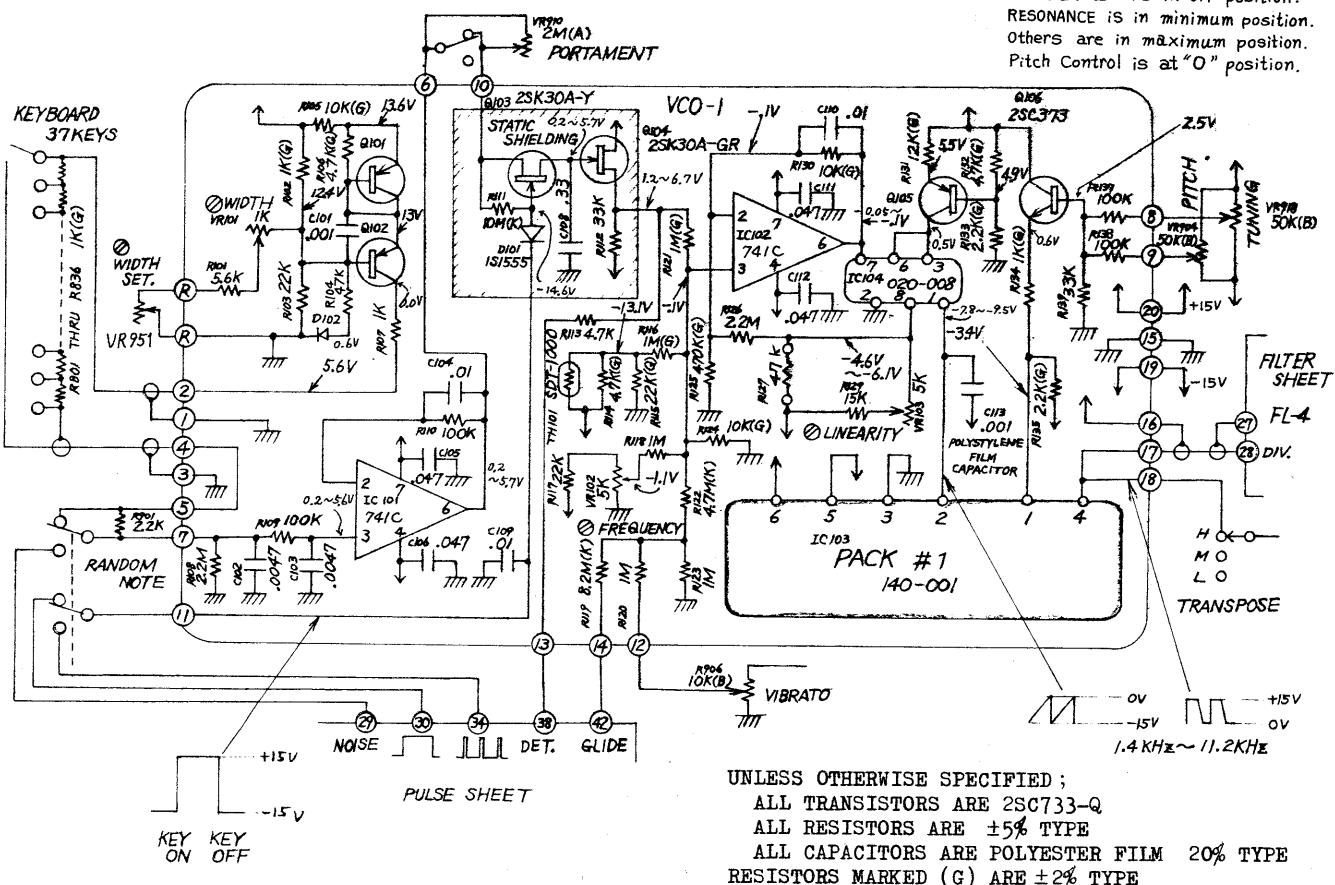
3. VCO SHEET ASSEMBLY (VCO-1)

3-1. PARTS LAYOUT



3-2. CIRCUIT DIAGRAM (VCO-1)

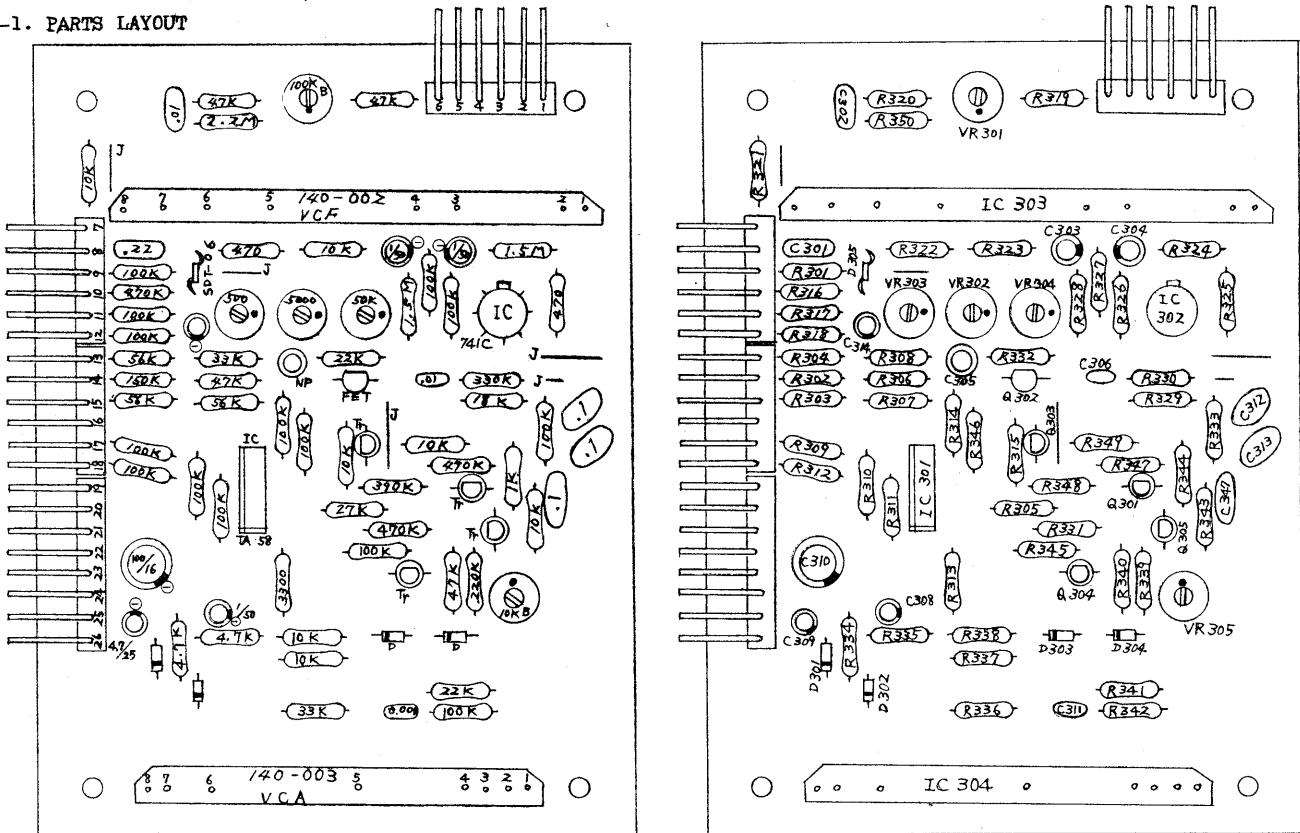
CONDITION : ALL tablets are in OFF position.
RESONANCE is in minimum position.
Others are in maximum position.
Pitch Control is at "0" position.



UNLESS OTHERWISE SPECIFIED;
ALL TRANSISTORS ARE 2SC733-Q
ALL RESISTORS ARE $\pm 5\%$ TYPE
ALL CAPACITORS ARE POLYESTER FILM 20% TYPE
RESISTORS MARKED (G) ARE $\pm 2\%$ TYPE
RESISTORS MARKED (K) ARE $\pm 10\%$ TYPE

4. VCF SHEET ASSEMBLY (VCF-1)

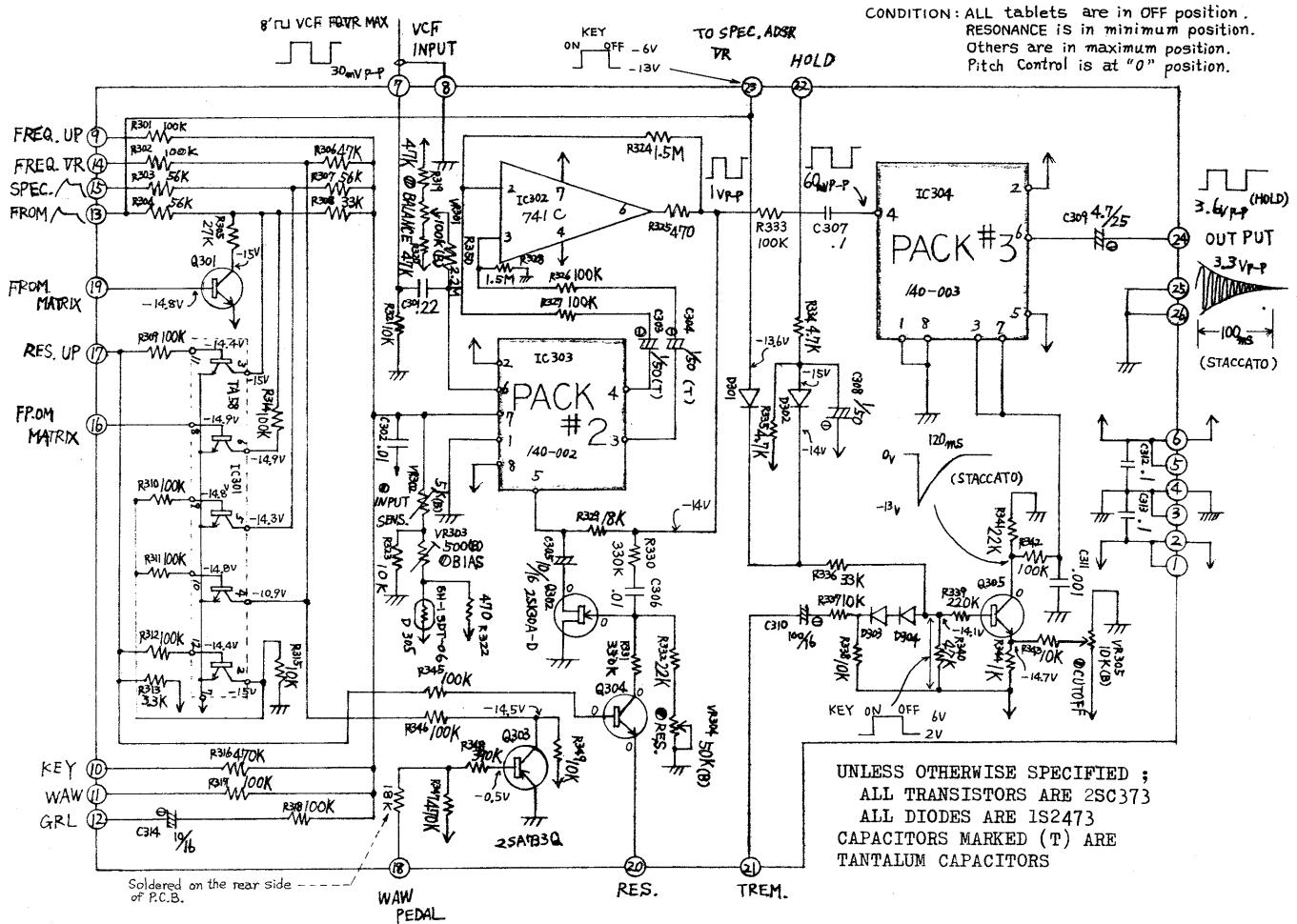
4-1. PARTS LAYOUT



FET : 2SK-30AD D : 1S-1555 or 1S-2473
 Tr : 2SC-828R or 2SC-373

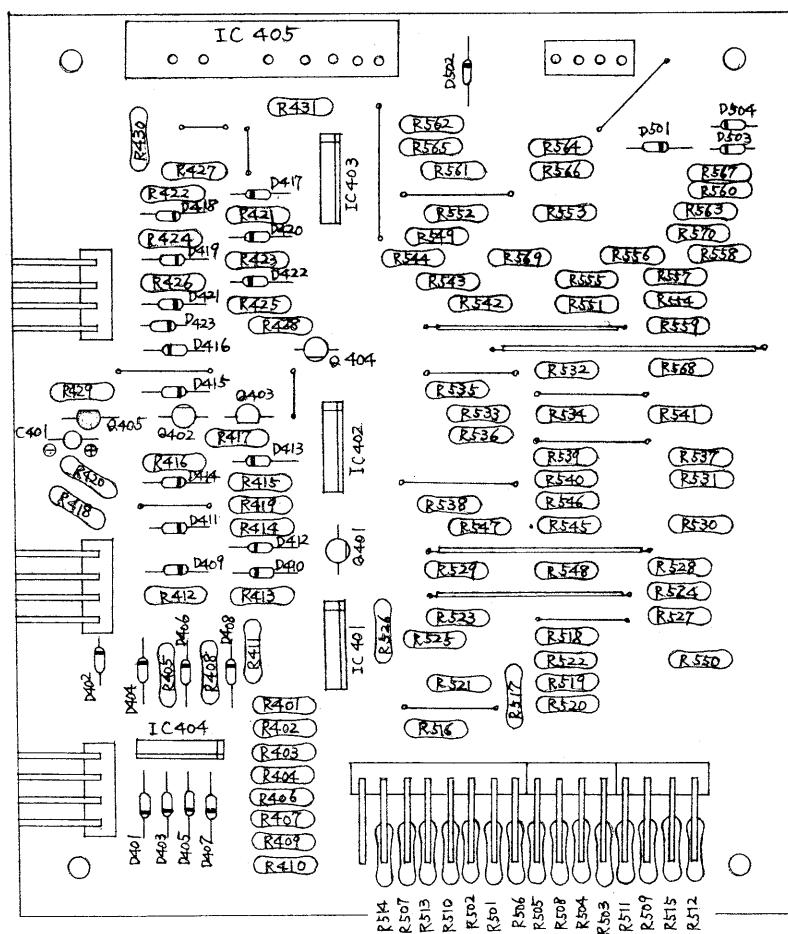
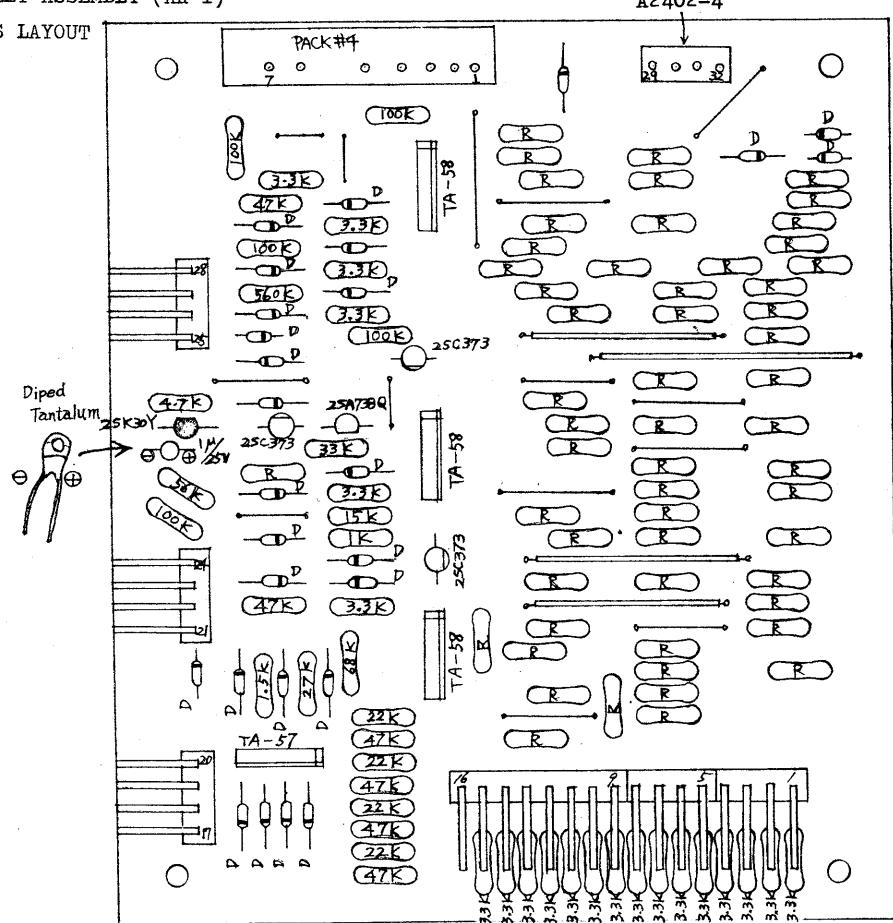
NP : NON polar Electrolytic Capacitor

4-2. CIRCUIT DIAGRAM (VCF-1)



5. ADSR SHEET ASSEMBLY (AR-1)

5-1. PARTS LAYOUT



5-2. CIRCUIT DIAGRAM (AR-1)

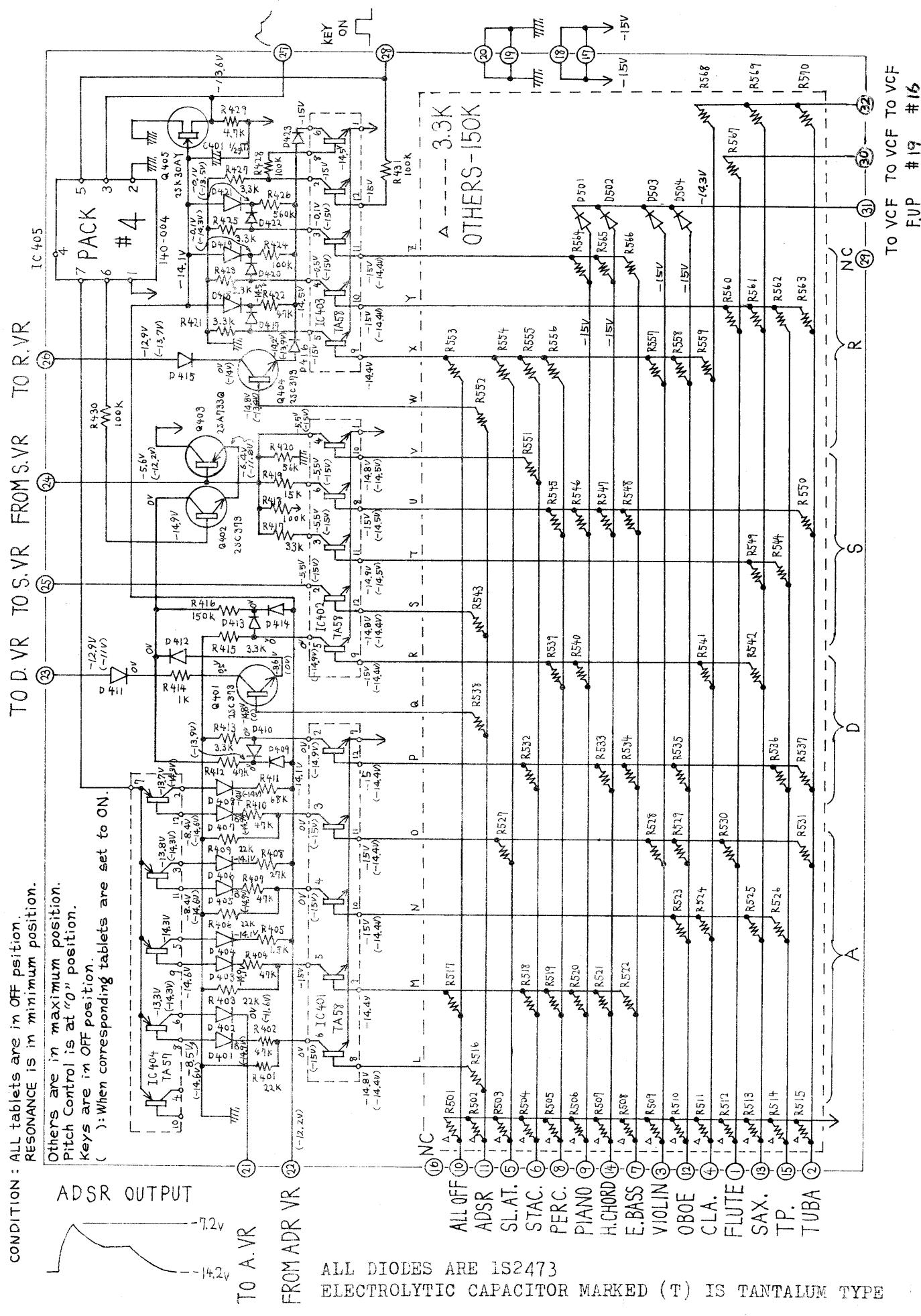
CONDITION : ALL tablets are in OFF position.
RESONANCE is in minimum position

Others are in maximum position. Pitch Control is at "0" position.

Keys are in OFF position.
(): When corresponding tablets are set to ON.

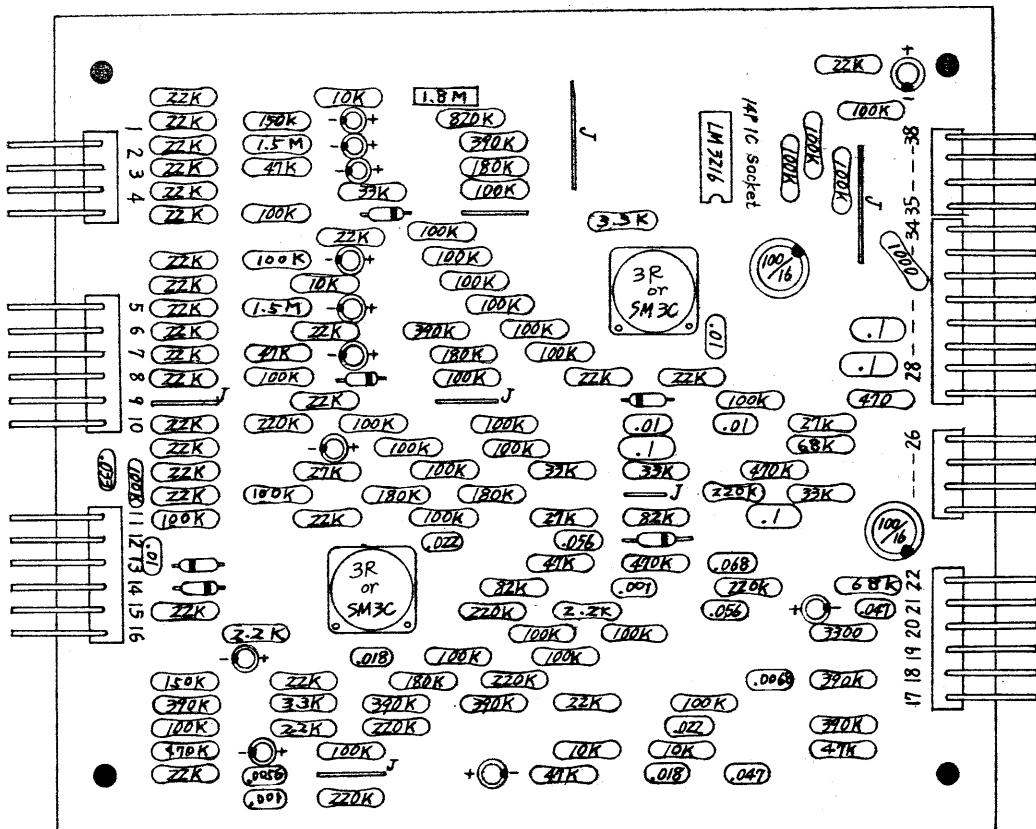
ADSR OUTPUT

ALL DIODES ARE 1S2473
ELECTROLYTIC CAPACITOR MARKED (T) IS TANTALUM TYPE



6. FILTER SHEET ASSEMBLY (FL-4)

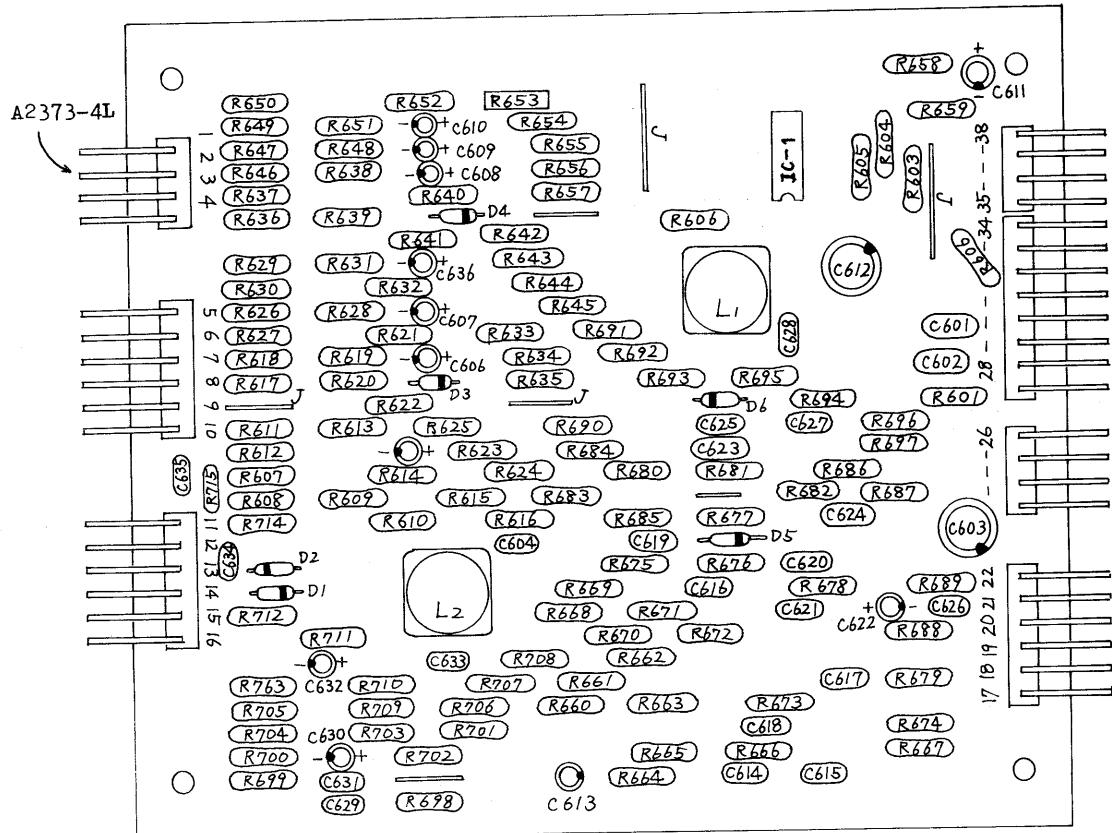
6-1. PARTS LAYOUT



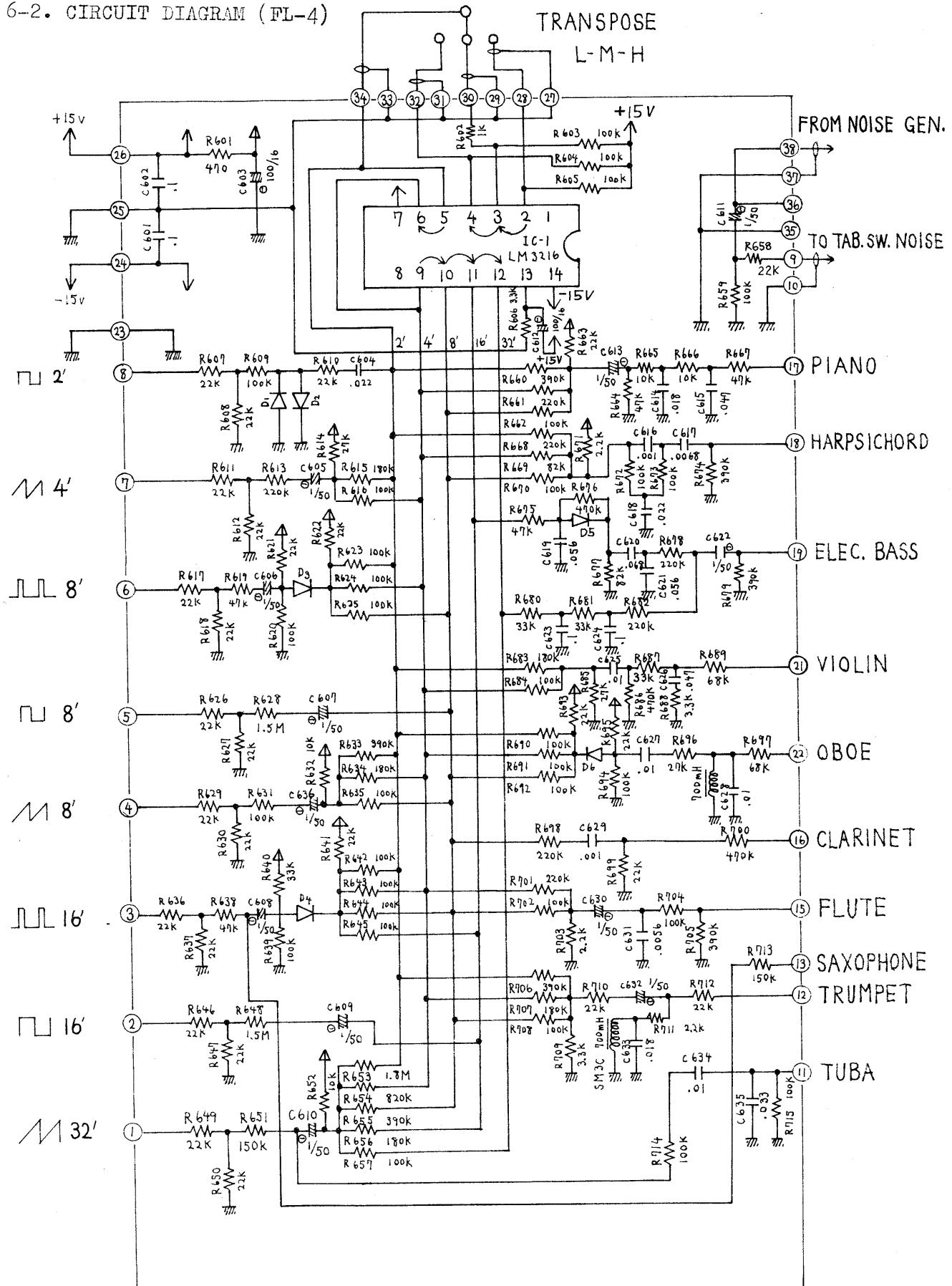
UNLESS OTHERWISE SPECIFIED

D : 152473

C : $1\mu\text{F}$ 50V



6-2. CIRCUIT DIAGRAM (FL-4)

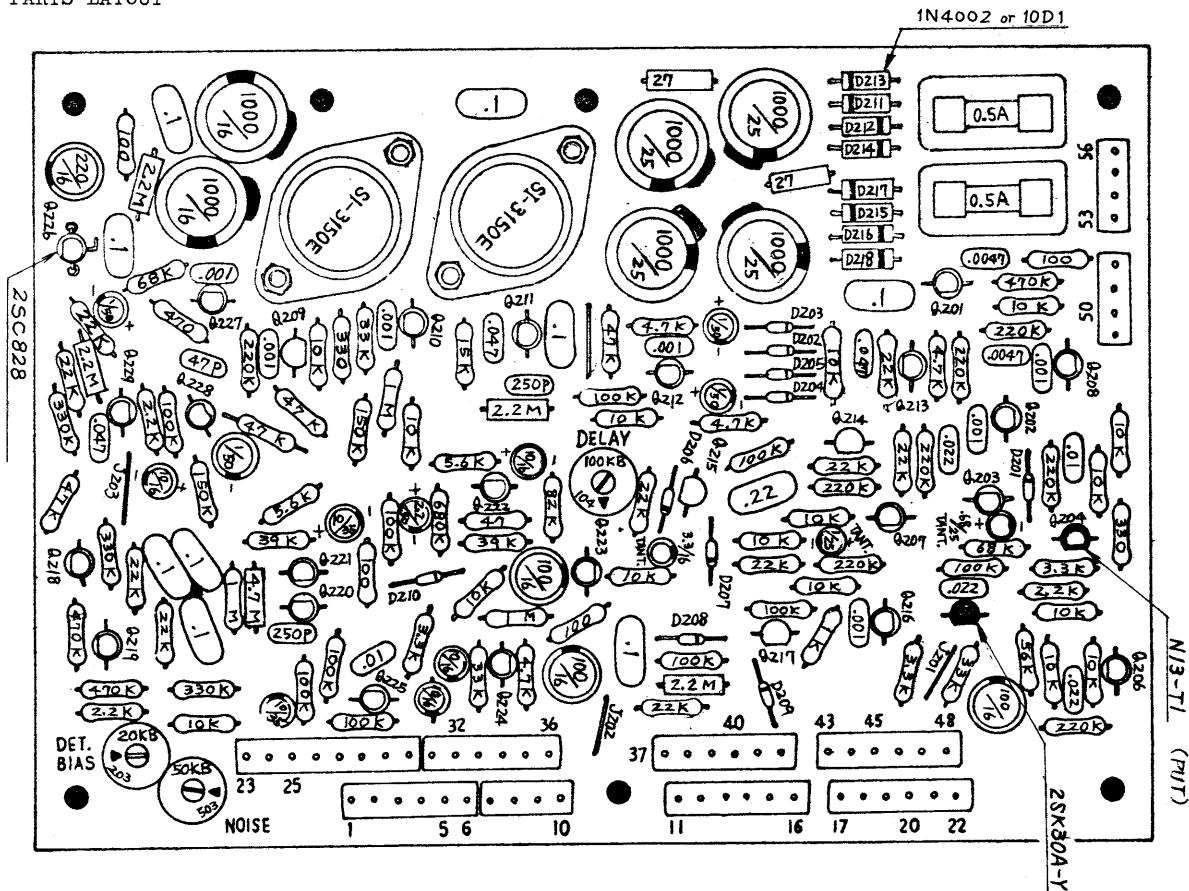


UNLESS OTHERWISE SPECIFIED :

ALL RESISTORS ARE $\pm 10\%$ TYPE, ALL DIODES ARE 1S2473
ALL CAPACITORS ARE POLYESTER FILM $\pm 20\%$ TYPE

7. PULSE SHEET ASSEMBLY (PL-1)

7-1. PARTS LAYOUT



Unless marked otherwise

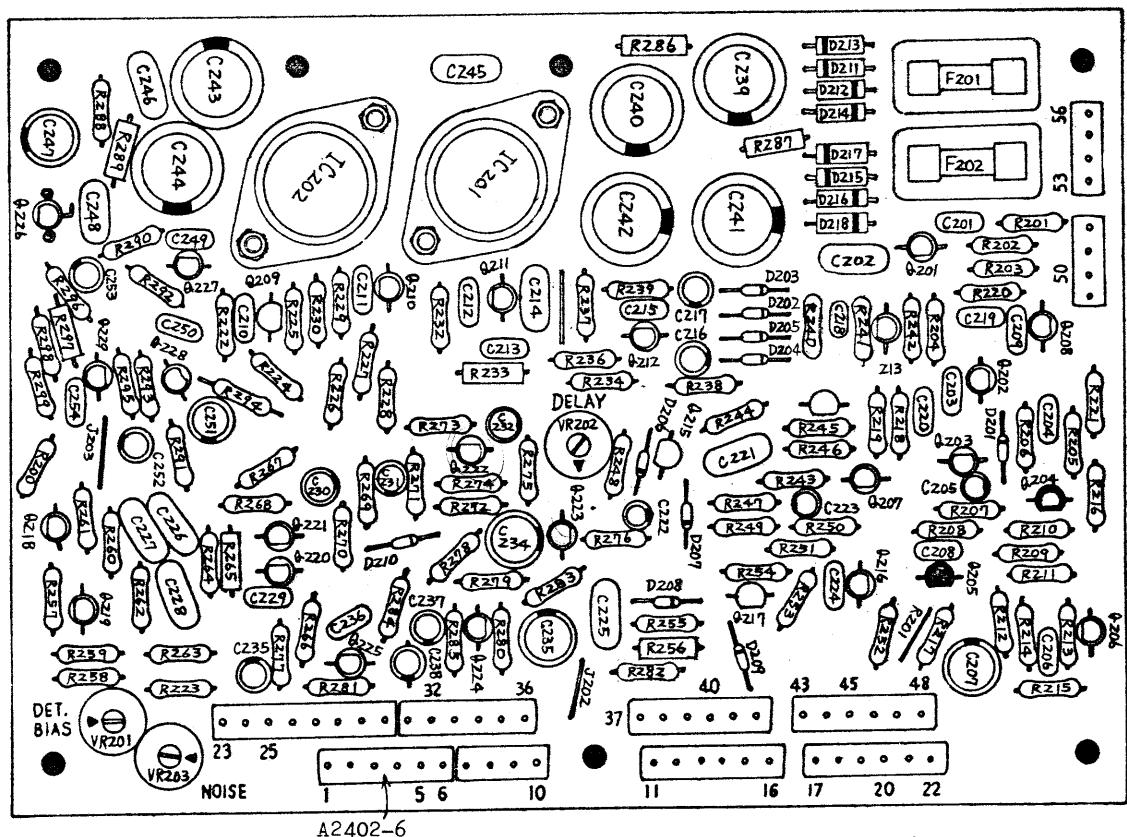
2SC373

------ 2SA733Q

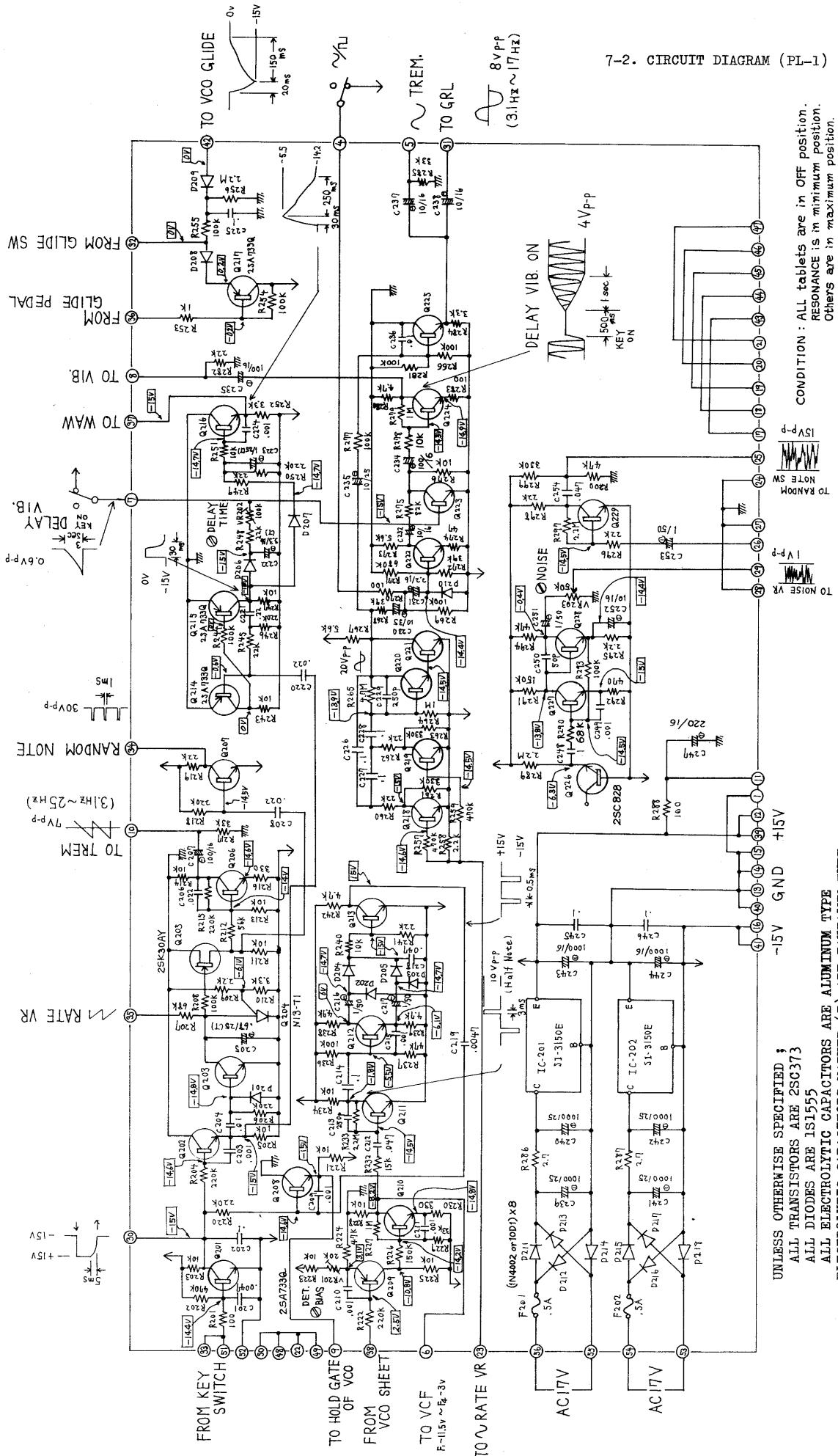
----- 1S-2473

Electrolytic Capacitor

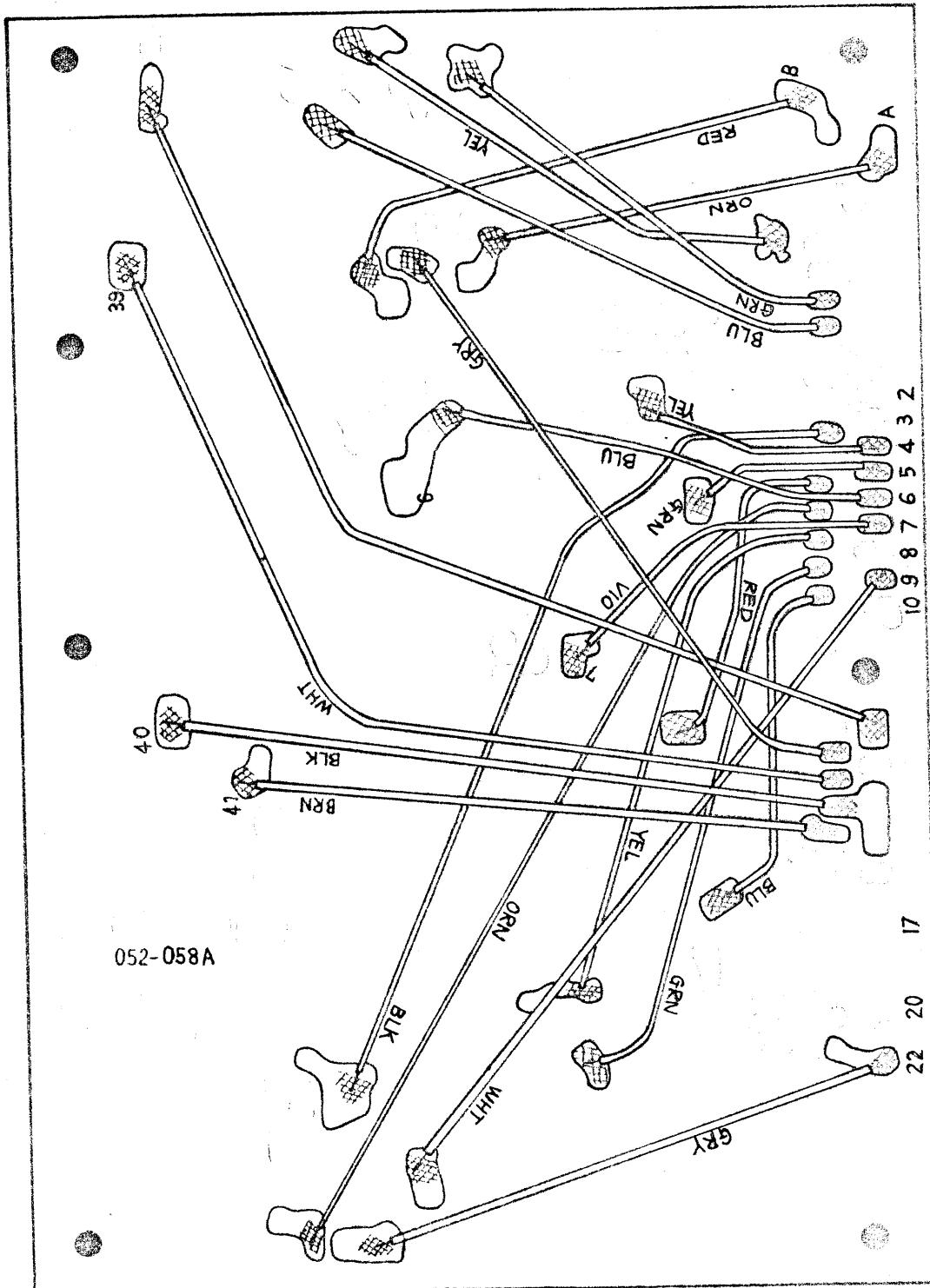
----- Tantalum Capacitor



7-2. CIRCUIT DIAGRAM (PL-1)



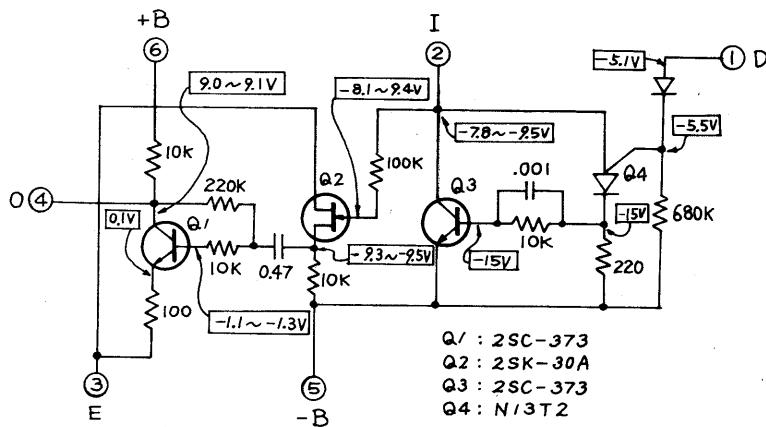
7-3. REAR SIDE WIRING OF PULSE SHEET (PL-1)



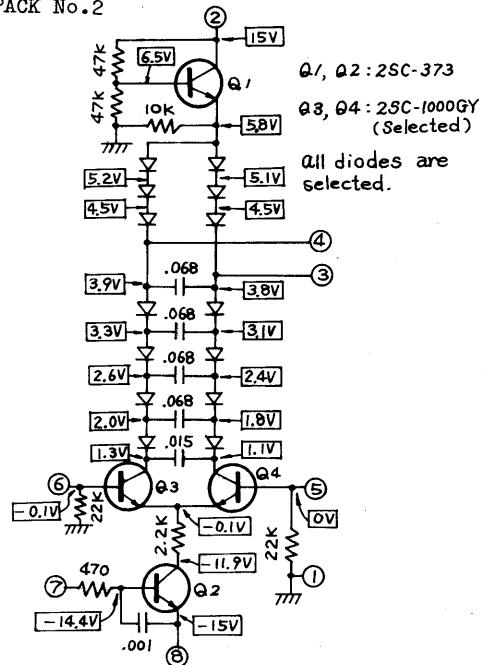
8. PACK ASSEMBLIES CIRCUIT DIAGRAM

CONDITION : All tablets are in OFF position.
RESONANCE is in minimum position.
Others are in maximum position.

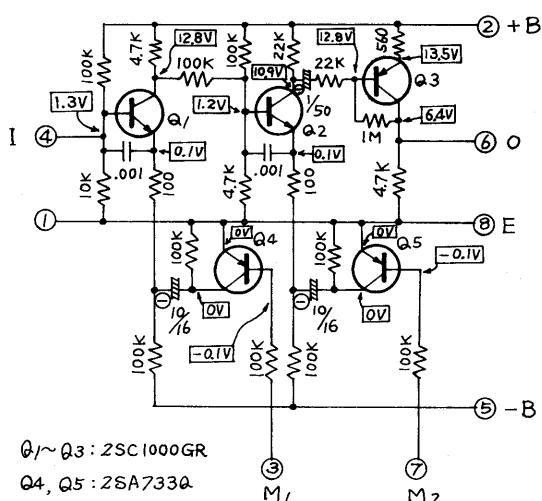
8-1. PACK No.1



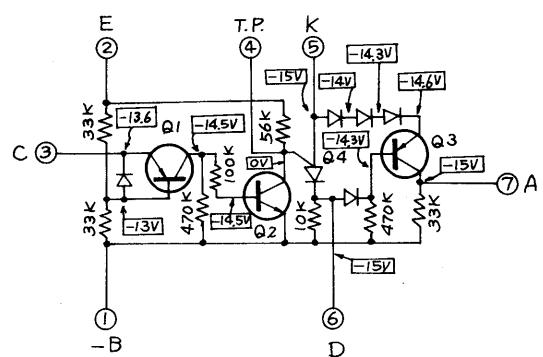
8-2. PACK No.2



8-3. PACK No.3



8-4. PACK No.4



9. ADJUSTMENT

Connect the Oscilloscope ground lead to ground, and the scope vertical input lead to terminal 3 of VR 917(Output).

Set the Transpose Switch at M position.

9-1. VCO CIRCUIT

A. NOTE :

- 1) Before adjustment, allow at least 3 minutes as a warm up period.
- 2) PITCH, TUNING and WIDTH SET(VR951) should be set to middle position.
- 3) If some parts (particularly IC's or transistors) have been replaced with a soldering iron, be sure to allow enough time for these parts to return to normal temperature before making adjustments.

B. ADJUSTMENT

- 1) Depress the F1 key with the 8' tablet ON, and adjust FREQ VR(VR102) to the frequency $f_1(176.4\text{Hz})$.
- 2) Adjust the OCTAVE-WIDTH(VR101) so that the frequency of the F3 key is $f_3(698.5\text{Hz})$.
- 3) Adjust the LINEARITY(VR103) so that the frequency of the F4 key is $f_4(1,397\text{Hz})$.
- 4) Repeat the above adjustments.
- 5) After 4) above, if the frequency of the F4 key is higher than 1,397 Hz, turn VR103 to raise the frequency ; if lower, turn VR103 to lower the frequency, and repeat 1) through 4) above.

The more times adjustments 1) through 4) are repeated, the less the tracking error.

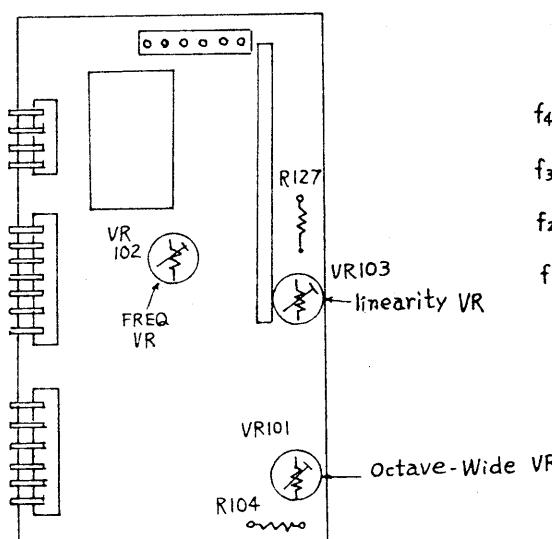


Fig. 1

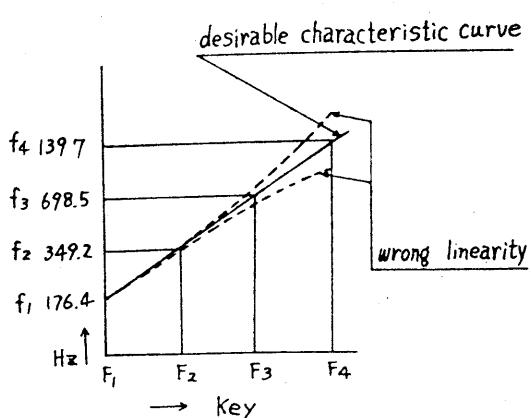


Fig. 2

6) Check that the frequencies of the F1, F2, F3, and F4 keys are $f_1 = 176.4\text{Hz}$, $f_2 = 349.2\text{Hz}$, $f_3 = 698.5\text{Hz}$ and $f_4 = 1.397\text{Hz}$ respectively.

There is no control for F2, so if F2 does not equal f_2 , then it is necessary to reduce the tracking error.

C. DETAILS FOR REDUCING F2 ERROR

1) Adjustment of frequency depends on the adjustment of the offset voltage of the operational amplifier (refer to Fig. 3). Turning VR102 counterclockwise (resistance value increases) lowers the frequency, turning VR102 clockwise (resistance value decreases) raises the frequency.

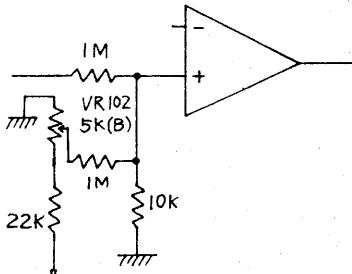


Fig. 3

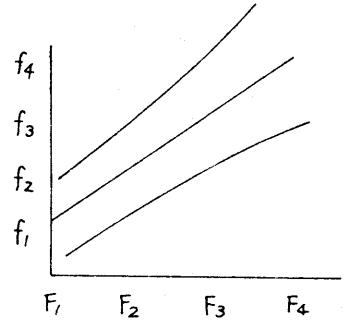


Fig. 4

2) Adjustment of Octave width

The characteristic curve of the frequency against voltage for the whole VCO can be varied by controlling IC1 of the constant current circuit by means of VR101 (refer to Fig. 6). If the curve is as in "a", turn VR101 clockwise (resistance value decreases); if "c", turn VR101 counterclockwise (resistance value increases). If adjustment cannot be made with VR101, change the value of R104. (Try a value of $10\text{K}\Omega$ higher or lower.)

Variation of VR101 does not affect the frequency of F_1 , so adjust the FREQ VR (VR102) so that the frequency of F_1 is $f_1(176.4\text{Hz})$. Then adjust the OCTAVE WIDTH (VR101) so that the frequency of F_3 is $f_3(698.5\text{Hz})$. If, after the above, the frequency of F_4 is not $f_4(1.397\text{Hz})$, adjust LINEARITY (VR103) for f_4 .

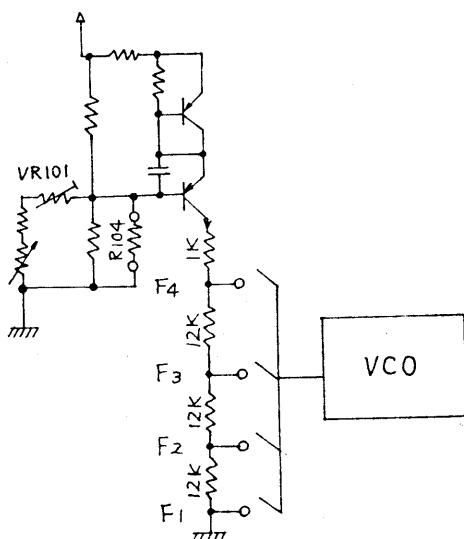
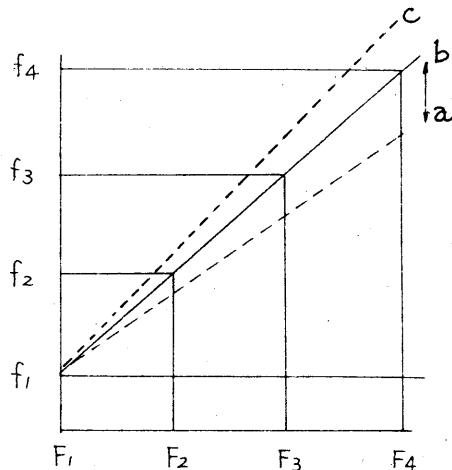


Fig. 5

Fig. 6



3) Adjustment of linearity

Turning VR103 clockwise (resistance value increases) sharpens the characteristic curve of the frequency against input voltage ; turning VR103 counterclockwise (resistance value decreases) flattens the curve. (refer to Figs. 7 and 8) If the adjustment cannot be made with VR103, change the value of R127.

Note that the variation of linearity greatly affects pitch and octave width.

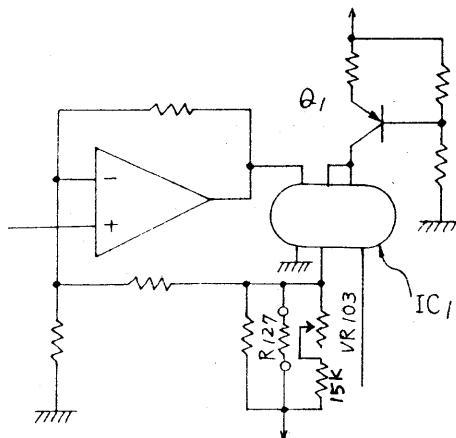


Fig. 7

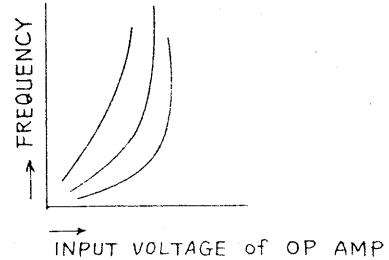


Fig. 8

9-2. VCA CIRCUIT

A. Adjustment of cutoff

STACCATO tab ON

8' tab ON

VR915 (CUTOFF) 10 (max.)

VR916 (RESONANCE) 0 (min.)

Depress the C2 key and adjust

VR305 so that decay time reaches
70ms at $1/10 E$ as in Fig. 9.

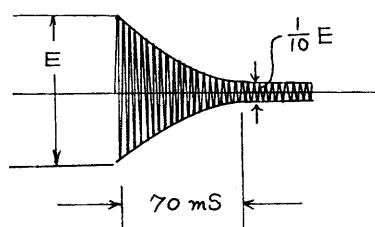


Fig. 9

B. Adjustment of STACCATO

Adjustment of Chromatic Trigger

STACCATO tab ON

8' \square tab ON

VR915(CUTOFF) 10 (max.)

VR916(RESONANCE) 0 (min.)

- 1) While holding the F4 key down, press the E3 key down and listen for the E3 pitch.
- 2) While holding the F1# key down, press the F1 key down and listen for the F1 pitch.
If the F1 note or the E4 note cannot be heard, adjust VR201 on the PL-1 board until the note is audible.
Confirm that both the E3 and the F1 pitches are audible.

9-3. VCF CIRCUIT

A. Adjustment of bias

* TUBA tab only ON

Hold the C3 key down and adjust VR 303 so that the trailing end of the wave is $1/4$ E as in Fig.10.

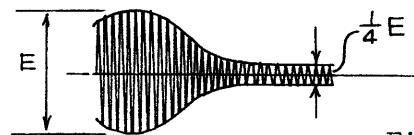


Fig. 10

Since this adjustment affects the wave form of the FLUTE, after the above adjustment, confirm that the wave form of the flute is correct.

B. Adjustment of RESONANCE

VR915(CUTOFF) 5

VR916(RESONANCE) 7

HOLD tab ON

Set VR304 at the point just before oscillation, then confirm that perfect oscillation can be obtained when VR916 is set at 10.

C. Adjustment of Input Sensitivity

VR916(RESONANCE) 10(max.)

VR915(CUTOFF) 5

- 1) Depress the F3 key and adjust the scope sweep and sync. controls to display two to four stationary cycles on the screen. If the wave form is abnormal, adjust VR301(BALANCE).

- 2) Depress the F2 key and adjust VR302(INPUT SENS) so as to get 1/2 stationary cycle of 1) above.
- 3) Depress the F3 key again and adjust VR303(BIAS) to restore the stationary wave form of 1) above.
- 4) Repeat step 2). If 1/2 stationary cycle cannot be obtained. adjust VR302 so that the error is a little larger.
- 5) Repeat all the step above until a 1/2 stationary cycle of 1) can be obtained.

NOTE : Make sure that the wave form of the F3 key remains the same as it was at the beginning of the adjustment, otherwise the tones of the TUBA and FLUTE will change.

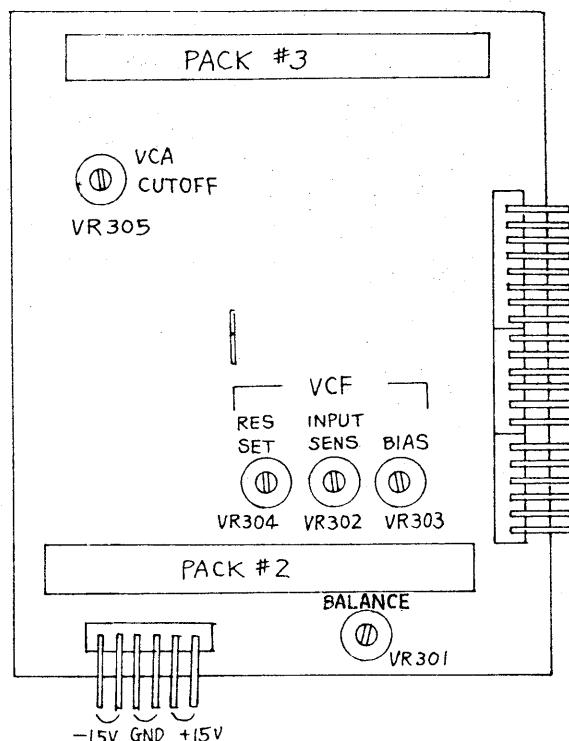


Fig. 11

10. PARTS LIST

GENERAL ASSEMBLY

164-001	Control Chassis (complete)	
165-001	Tablet Chassis (complete)	
001-101	37-note Keyboard (complete)	SK-132A
Keyboard Parts		
	Key Assembly	Natural (white) C, D, E, F, G, A, B, C'
	"	Sharp (black)
	Plastic Key	Natural C, D, E, F, G, A, B, C, C'
	"	Sharp
	Key Arm	Natural
	"	Sharp
	Key Spring	No.52
	Actuator Gum	
	Actuator (Yellow, White, Black)	
	Contact Leaf (Old type)...	(used with only Yellow Actuator)
	"	No.1 (used with only White or Black Actuator)
	Leaf Holder	6P
	"	7P
	Printed Circuit Board	6P
	"	7P
	Key Holder	7P
	"	5P
	"	1P
	Guide Bushing	No.16
	Blind	No.26
	Stop Felt	No.14
	Level Felt	No.10
	"	No.31
	Connector	2145-3C
	Resistor	1 Kohm 1/4 R 2%
081-035	Cabinet (only)	No.35
086-005	Upper Board	No.5
068-018	Bushing	No.18 (for Music Rack)
091-001	Side Block	No.1 Black (right)
091-004	"	No.4 " (left)
064-030	Holder	No.30 (for Side Block)
072-042	Panel	No.42 (above the Lever Switches)
061-040	Chassis	No.40 (below the Lever Switches)
Music Rack Assembly		
092-002	Music Rack	No.2 (Panel only)
064-026	Holder	No.26
010-008	Connector Housing	2139-4
010-009	"	2139-6
010-010	"	2139-8
042-015	Pin Terminal	2578T
010-011	Miniature Connector Housing	1625-12P
010-012	"	1625-12R
042-013	Connector Pin	1560T (P)
042-014	"	1561T (R)
075-012	Name Plate	

CONTROL CHASSIS ASSEMBLY

152-001A	VCO-1 (complete)	
061-038A	Chassis	No.38A
072-043	Panel	No.43
072-048	Rear Panel	No.48
016-021	Knob (small)	TK-1114 (or TK-1114A... from SERIAL No.006050)

016-026	Knob (large)	TK-1113 (or TK-1113A... from SERIAL No.006050)
016-003	" (for Slide Potentiometer)	No.3 (with white stripe - Plate No.1)
001-047	Seesaw Switch	T811
009-001	Jack	SG-7615 No.5
001-002	Voltage Changer	XW-103-1-10
047-019	Cord Bushing	R-5 Black
025-003	Pilot Lamp	BN-8 Red
	Light Emitting Diode	SLP-24B (from SERIAL No.006300)
	Bracket	No.4 (from SERIAL No.006300)
001-045	Lever Switch (Dpst)	ESL-2411
001-044	" (Dpdt)	ESL-2412
	Power Transformer No.27	B-C (100 - 120V) B-D (220 - 250V)
	Power Supply Cord (with Plug)	SVT 3m
	Cord Binder	No.11 Nylo Clip
001-049	Push Button switch	No.44 Red
008-013	Fuse (wire lead type)	1A
001-018	Slide Switch	SW-321 (output)
065-031	Rubber Cover	No.31
065-034	" "	No.34
065-037	" "	No.37
028-275	Potentiometer	10 Kohm(A) EVCBOAS(K)20A14 (from SERIAL No.006050)
028-285	"	10 Kohm(B) EVCBOAS(K)20B14 "
028-277	"	50 Kohm(A) EVCBOAS(K)20A54 "
028-287	"	50 Kohm(B) EVCBOAS(K)20B54 "
028-262	"	50 Kohm(B) EVCBOAS10B54
028-290	"	500Kohm(B) EVCBOAS(K)20B55 (from SERIAL No.006050)
028-282	"	2 Mohm(A) EVCBOAS(K)20A26 "
028-035	Slide Potentiometer	50 Kohm(A) EVAQOAA00A54
028-024	"	50 Kohm(B) EVAQOAA00B54
028-036	"	100Kohm(A) EVAQOAA00A15
028-038	"	500Kohm(A) EVAQOAA00A55
028-039	"	1 Mohm(A) EVAQOAA00A16

TABLET CHASSIS ASSEMBLY

061-039	Chassis	No.39
153-001A	VCF Sheet (complete)	VCF-1
155-001A	ADSR Sheet (complete)	AR-1
145-004A	Filter Sheet (complete)	FL-4
156-001A	Pulse Sheet (complete)	PL-1
001-046	Lever Switch	ESL-2413(Dpst)
003-001	Tablet	No.1 Ivory
003-002	"	No.2 Maroon
003-003	"	No.3 Yellow
003-004	"	No.4 Green
003-005	"	No.5 Grey
124-001	Lockpin (S. Lever - Tablet)	
028-303	Potentiometer	1 Kohm(B) EVR20AS15B13

SEMICONDUCTORS

020-008	IC 104	μ PA-41C
	IC	741C (TA7504M) OP amplifier
020-007	IC	LM3216
020-011	IC	TA-58
020-012	IC	TA-57
020-013	IC	SI-3150E
	IC	830C
017-012	Silicon Transistor	2SA733Q
017-011	"	2SC373

	Silicon Transistor	2SC828Q
017-008	"	2SC828R
		2SB4340
017-018	PUT	N13-T1
		N13-T2
017-014	Field Effect Transistor	2SK30A-Y
017-016	"	2SK30A-GR
017-017	"	2SK30A-D or A
018-014	Silicon Diode	1S2473
	"	1N4002
	"	1OD-1
018-015	Thermistor	SDT-1000
018-016	"	SDT-06
140-001	Pack No.1 (complete)	
140-002A	Pack No.2A (complete)	
140-003A	Pack No.3A (complete)	
140-004A	Pack No.4A (complete)	

RESISTORS

	Semifixed Resistor	1 Kohm(B)	PNB04C3A102H(VC0-1)
	(Trimmer Preset Pot.)	5 Kohm(B)	PNB04C3A502H(VC0-1)
028-001	"	500 ohm(B)	EVLR4XA00B52
028-003	"	5 Kohm(B)	EVLR4XA00B53
028-004	"	10 Kohm(B)	EVLR4XA00B14
028-005	"	20 Kohm(B)	EVLR4XA00B24
028-006	"	50 Kohm(B)	EVLR4XA00B54
028-007	"	100Kohm(B)	EVLR4XA00B15
044-017	Carbon Film Resistor	22 ohm 1/4 R ± 5%	
044-021	"	47 ohm	"
044-025	"	100 ohm	"
044-031	"	330 ohm	"
044-033	"	470 ohm	"
044-037	"	1 Kohm	"
044-038	"	1.5Kohm	"
044-040	"	2.2Kohm	"
044-042	"	3.3Kohm	"
044-044	"	4.7Kohm	"
044-045	"	5.6Kohm	"
044-048	"	10 Kohm	"
044-050	"	15 Kohm	"
044-051	"	18 Kohm	"
044-052	"	22 Kohm	"
044-053	"	27 Kohm	"
044-054	"	33 Kohm	"
044-055	"	39 Kohm	"
044-056	"	47 Kohm	"
044-057	"	56 Kohm	"
044-058	"	68 Kohm	"
044-059	"	82 Kohm	"
044-060	"	100Kohm	"
044-062	"	150Kohm	"
044-063	"	180Kohm	"
044-064	"	220Kohm	"
044-066	"	330Kohm	"
044-067	"	390Kohm	"
044-068	"	470Kohm	"
044-069	"	560Kohm	"

044-070	Carbon Film Resistor	680Kohm	1/4 R	+ 5%
044-071	"	820Kohm	"	
044-072	"	1 Mohm	"	
044-074	"	1.5Mohm	"	
044-076	"	2.2Mohm	"	
044-737	"	1 Kohm	1/4 R	+ 2%
044-741	"	2.2Kohm	"	
044-744	"	3.9Kohm	"	
044-745	"	4.7Kohm	"	
044-749	"	10 Kohm	"	
044-750	"	12 Kohm	"	
044-753	"	22 Kohm	"	
044-768	"	470Kohm	"	
044-772	"	1 Mohm	"	
044-095	Carbon Solid Resistor	2.7ohm	ERC-12GK	+ 10%
044-165	"	1.8Mohm	"	
044-160	"	2.2Mohm	ERC-12GJ	+ 5%
044-166	"	2.2Mohm	ERC-12GK	+ 10%
044-170	"	4.7Mohm	"	"
044-598	"	8.2Mohm	"	"
044-599	"	10 Mohm	"	"

CAPACITORS

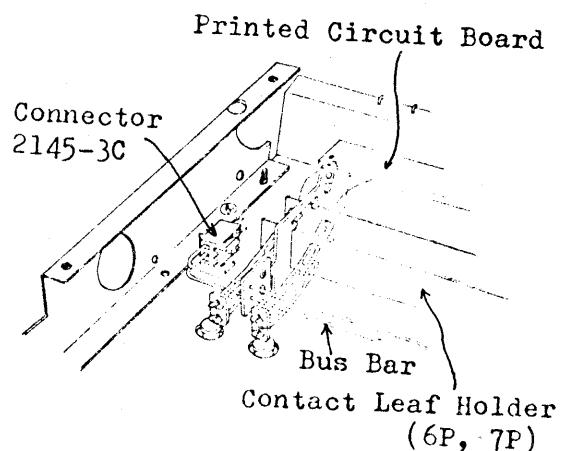
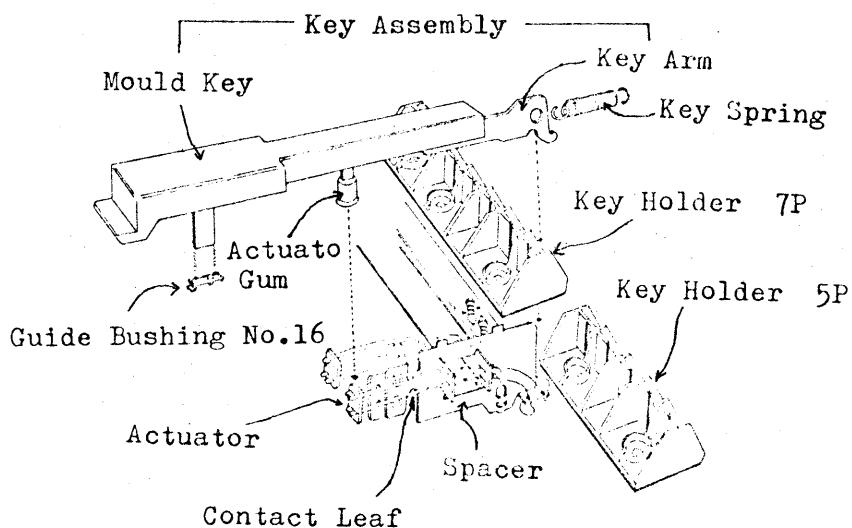
035-111	Polystyrol Film Capacitor	.001mfd	50V	+ 10%
035-005	Plastic(Mylar) Film Capacitor	.001mfd	50V	+ 20%
035-009	"	.0022mfd	"	"
035-012	"	.0047mfd	"	"
035-013	"	.0056mfd	"	"
035-014	"	.0068mfd	"	"
035-016	"	.01 mfd	"	"
035-019	"	.018 mfd	"	"
035-020	"	.022 mfd	"	"
035-022	"	.033 mfd	"	"
035-024	"	.047 mfd	"	"
035-025	"	.056 mfd	"	"
035-026	"	.068 mfd	"	"
035-028	"	.1 mfd	"	"
035-032	"	.22 mfd	"	"
035-034	"	.33 mfd	"	"
037-005	Ceramic Capacitor	47	pfd	50V Disc Type
037-007	"	250	pfd	" "
032-096	Tantalum Capacitor (diped)	.68	mfd	25V
032-098	"	1	mfd	"
032-071	"	1	mfd	35V
032-100	"	3.3	mfd	16V
032-071	Electrolytic Capacitor	1	mfd	ECE-A 50V
032-072	"	2.2	mfd	" "
032-046	"	4.7	mfd	" 25V
032-019	"	10	mfd	" 16V
032-061	"	10	mfd	" 35V
032-023	"	100	mfd	" 16V
032-038	"	220	mfd	" 16V
032-041	"	1000	mfd	" 16V
032-055	"	1000	mfd	" 25V
032-191	"	10	mfd	NP ECE-A 16N10
032-037	"	100	mfd	ECE-A16V100L

OTHERS

022-013	Coil	SM-3C or 3R
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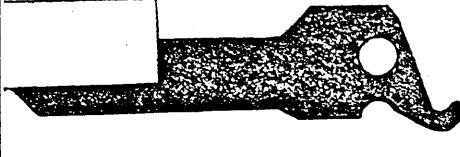
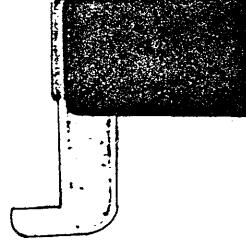
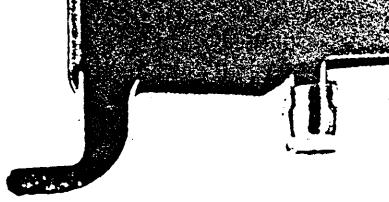
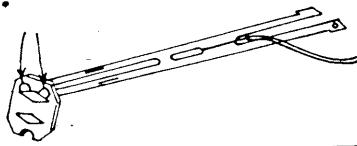
010-016	Connector Wafer Pin	A2373-4L	right angele
010-017	"	A2373-6L	
010-018	"	A2373-8L	
010-013	"	A2402-4	flat
010-014	"	A2402-6	
010-015	"	A2402-8	
065-030	Cover	No.30 (on VCO Sheet Assembly)	
012-006	IC Socket Assembly	(for LM-3216)	
012-003	Fuse Holder	TF-758	
008-024	Fuse	0.5A (Miniature Tube)	

* PARTS PICTORIAL



KEYBOARD PARTS

Refer to the following table for Keyboard Parts replacement.

NAME	FORMER	INTERCHANGEABILITY	
		YES	LATER
NATURAL key		YES	
SHARP key		NO	
KEY SPRING	natural <i>No. 54</i> 	YES	 <i>No. 52</i>
	sharp only <i>No. 53</i> 	NO	
CONTACT LEAF		YES	
ACTUATOR	 <i>No. 1</i> Be sure to bend the tip of leaf to avoid that it comes out. 		 <i>No. 3</i> White or Black Be sure to use a Contact Leaf and a Actuator with pair.

